

What is claimed is:

1. An arc fault protection device, protective of an electrical distribution system having a load, comprising:
 - a sensor for sensing arc fault signatures in the presence of unwanted arc fault mimicking noise;
 - a load current threshold detector; and
 - first and second filters for distinguishing arc fault signatures from said unwanted arc mimicking noise having first and second sets of characteristics, respectively;wherein said first filter is enabled if a load current is below said load current threshold, and said second filter is enabled if said load current is above said load current threshold.
2. A device according to claim 1, further comprising an interrupting mechanism responsive to a signal from at least one of said first and second filters, wherein said interrupting mechanism disconnects said load from said electrical distribution system.
3. A device according to claim 1, wherein said electrical distribution system is protected by an overcurrent device having a rating, wherein said load threshold current is below said rating of said overcurrent device.
4. A device according to claim 3, wherein said overcurrent device rating is between about 15 to about 30 amperes.
5. A device according to claim 4, wherein said overcurrent device is a circuit breaker.
6. A device according to claim 4, wherein said overcurrent device is a fuse.
7. A device according to claim 1, wherein said sensor detects di/dt in said load current.
8. A device according to claim 7, wherein said sensor includes a toroidal transformer.

1 9. A device according to claim 8, wherein said load current threshold detector derives
2 a signal from said toroidal transformer.

1 10. A device according to claim 8, wherein said load current threshold detector
2 derives a signal from a resistive shunt in series with a hot or neutral conductor of said
3 electrical distribution system.

1 11. A device according to claim 1, wherein said first and second filters are
2 incorporated in a microprocessor.

1 12. An arc fault protection device, protective of an electrical distribution system
2 having a load, comprising:
3 a sensor for sensing arc fault signatures in the presence of unwanted arc fault
4 mimicking noise;
5 a load current threshold detector; and
6 first and second filters for distinguishing arc fault signatures from said
7 unwanted arc mimicking noise having first and second sets of characteristics,
8 respectively;
9 wherein said first filter is enabled if a load current is below said load current
10 threshold, and said first and second filters are enabled if said load current is above
11 said load current threshold.

1 13. A device according to claim 12, further comprising an interrupting mechanism
2 responsive to a signal from at least one of said first and second filters, wherein said
3 interrupting mechanism disconnects said load from said electrical distribution system.

1 14. A device according to claim 12, wherein said electrical distribution system is
2 protected by an overcurrent device having a rating, wherein said load current
3 threshold is below said rating of said overcurrent device.

1 15. A device according to claim 12, wherein said sensor detects di/dt in said load
2 current.

1 16. A device according to claim 15, wherein said sensor includes a toroidal
2 transformer.

1 17. A device according to claim 12, wherein said load current threshold detector
2 derives a signal from a resistive shunt in series with a hot or neutral conductor of said
3 electrical distribution system.

1 18. A device according to claim 12, wherein said first and second filters are
2 incorporated in a microprocessor.

1 19. An arc fault protection device, protective of an electrical distribution system
2 having a load, comprising:
3 a sensor for sensing arc fault signatures in the presence of unwanted arc fault
4 mimicking noise;
5 a first load current threshold detector;
6 a second load current threshold detector; and
7 first and second filters for distinguishing arc fault signatures from said
8 unwanted arc mimicking noise having first and second sets of characteristics,
9 respectively;
10 wherein said first filter is enabled if a load current exceeds said first load
11 current threshold, and said second filter is enabled if said load current exceeds said
12 second load current threshold.

1 20. A device according to claim 19, further comprising an interrupting mechanism
2 responsive to a signal from at least one of said first and second filters, wherein said
3 interrupting mechanism disconnects said load from said electrical distribution system.

1 21. A device according to claim 19, wherein said electrical distribution system is
2 protected by an overcurrent device having a rating, wherein said second load current
3 threshold is below said rating of said overcurrent device.

1 22. A device according to claim 19, wherein said sensor detects di/dt in said load
2 current.

1 23. A device according to claim 22, wherein said sensor includes a toroidal
2 transformer.

1 24. A device according to claim 19, wherein at least one of said first and second load
2 current threshold detectors derives a signal from a resistive shunt in series with a hot
3 or neutral conductor of said electrical distribution system.

1 25. A device according to claim 19, wherein said first and second filters are
2 incorporated in a microprocessor.

1 26. A device according to claim 19, wherein said first load current threshold detector
2 is set below said second load current threshold detector; and said first and second
3 filters are disabled if said load current is below said first load current threshold.

1 27. A device according to claim 26, wherein said first load current threshold is about
2 5 amperes.

1 28. An arc fault protection device, protective of an electrical distribution system
2 having a load, comprising:

3 means for sensing arc fault signatures in the presence of unwanted arc fault
4 mimicking noise;

5 a load current threshold detector; and

6 first and second filter means for distinguishing arc fault signatures from said
7 unwanted arc mimicking noise having first and second sets of characteristics,
8 respectively;

wherein said first filter means is enabled if a load current is below said load current threshold, and said second filter means is enabled if said load current is above said load current threshold.

29. An arc fault protection device, protective of an electrical distribution system having a load, comprising:

means for sensing arc fault signatures in the presence of unwanted arc fault mimicking noise;

a load current threshold detector; and

first and second filter means for distinguishing arc fault signatures from said unwanted arc mimicking noise having first and second sets of characteristics, respectively;

wherein said first filter means is enabled if a load current is below said load current threshold, and said first and second filter means are enabled if said load current is above said load current threshold.

30. An arc fault protection device, protective of an electrical distribution system having a load, comprising:

means for sensing arc fault signatures in the presence of unwanted arc fault mimicking noise;

a first load current threshold detector;

a second load current threshold detector; and

first and second filter means for distinguishing arc fault signatures from said unwanted arc mimicking noise having first and second sets of characteristics, respectively;

wherein said first filter means is enabled if a load current exceeds said first load current threshold, and said second filter means is enabled if said load current exceeds said second load current threshold.

1 31. An arc fault protection device, protective of an electrical distribution system
2 which includes at least first and second conductors and having a load connected
3 across said first and second conductors, comprising:
4 detecting means for detecting a di/dt signal on one of said first and second
5 conductors;
6 sensing means for sensing a load current of said electrical distribution system;
7 and
8 determining means for determining whether said di/dt signal is indicative of
9 noise, a parallel arc fault, or a series arc fault.

1 32. A device according to claim 31, further comprising interrupting means,
2 responsive to said determining means, for interrupting said electrical distribution
3 system from said load when an arc fault is present.

1 33. A device according to claim 31, wherein said determining means uses a first set
2 of characteristics to determine whether said di/dt signal is indicative of noise or a high
3 level arc fault and a second set of characteristics to determine whether said di/dt
4 signal is indicative of noise or a low level arc fault.

1 34. A device according to claim 33, wherein said determining means uses either said
2 first set of characteristics or said second set of characteristics based on input received
3 from said sensing means.

1 35. A device according to claim 34, wherein said sensing means includes means for
2 comparing a magnitude of a line frequency of said electrical distribution system to a
3 predetermined level.

1 36. A device according to claim 34, wherein said sensing means includes a resistive
2 shunt sensor.

1 37. A device according to claim 34, wherein said sensing means includes a toroidal
2 transformer.

1 38. A device according to claim 31, wherein said determining means uses a first set
2 of characteristics to determine whether said di/dt signal is indicative of noise, a
3 parallel arc fault, or a series arc fault and a second set of characteristics to determine
4 whether said di/dt signal is indicative of noise or an arc fault when an arcing current
5 exceeds a rating of an overcurrent protection device protecting said electrical
6 distribution system.

1 39. A method for protecting an electrical distribution system which includes at least
2 first and second conductors and having a load connected across said first and second
3 conductors, comprising the steps of:

4 detecting a di/dt signal on one of said first and second conductors;

5 sensing a load current of said electrical distribution system; and

6 determining whether said di/dt signal is indicative of noise, a parallel arc fault,
7 or a series arc fault.

1 40. A method according to claim 39, further comprising the step of interrupting said
2 electrical distribution system from said load when an arc fault is present.

1 41. A method according to claim 39, wherein said step of determining uses a first set
2 of characteristics to determine whether said di/dt signal is indicative of noise or a high
3 level arc fault and a second set of characteristics to determine whether said di/dt
4 signal is indicative of noise or a low level arc fault.

1 42. A method according to claim 41, wherein said step of determining uses either
2 said first set of characteristics or said second set of characteristics based on input
3 received from said step of sensing.

1 43. A method according to claim 42, wherein said step of sensing includes comparing
2 a magnitude of a line frequency of said electrical distribution system to a
3 predetermined level.

1 44. A method according to claim 41, wherein said step of sensing includes
2 connecting a resistive shunt sensor to one of said conductors.

1 45. A method according to claim 41, wherein said step of sensing includes
2 connecting a toroidal transformer to one of said conductors.

1 46. A method according to claim 39, wherein said step of determining uses a first set
2 of characteristics to determine whether said di/dt signal is indicative of noise, a
3 parallel arc fault, or a series arc fault and a second set of characteristics to determine
4 whether said di/dt signal is indicative of noise or an arc fault when an arcing current
5 exceeds a rating of an overcurrent protection device protecting said electrical
6 distribution system.